

**WEST**[Help](#) [Logout](#)[Main Menu](#) [Search Form](#) [Posting Counts](#) [Show S Numbers](#) [Edit S Numbers](#)**Search Results -**

Terms	Documents
110 and 14	0

Database: [US Patents Full-Text Database](#) Refine Search:   **Search History**

<u>DB Name</u>	<u>Query</u>	<u>Hit Count</u>	<u>Set Name</u>
USPT	110 and 14	0	<u>L11</u>
USPT	(surge or sags) adj4 voltage	3120	<u>L10</u>
USPT	18 and 14	0	<u>L9</u>
USPT	dropout\$	4588	<u>L8</u>
USPT	l6 and 14	0	<u>L7</u>
USPT	transient adj2 (pulse or amplitude)	1310	<u>L6</u>
USPT	AC and 14	16	<u>L5</u>
USPT	l2 and 11	44	<u>L4</u>
USPT	predict\$ adj5 l2	6	<u>L3</u>
USPT	(power adj3 (fail\$ or fault\$))	16759	<u>L2</u>
USPT	(trend\$1) adj3 (analy\$ or monitor\$)	856	<u>L1</u>

**WEST****Help      Logout**

Main Menu	Search Form	Result Set	Show S Numbers	Edit S Numbers	Referring Patents
First Hit		Previous Document		Next Document	
Full	Title	Citation	Front	Review	Classification Date Reference Claims KWIC

**Document Number 4**

Entry 4 of 16

File: USPT

Apr 15, 1997

DOCUMENT-IDENTIFIER: US 5621776 A

TITLE: Fault-tolerant reactor protection system

**DEPR:**

Battery chargers 20 in each vault serve as qualifiable electrical isolation devices. Each alternating current (ac) bus 22 is supplied from two different sources. Each of the ac busses is sourced from either of two high-voltage ac busses for added reliability and availability.

**DEPR:**

Facility power is distributed throughout the plant as alternating current (ac) at a kilovolt level via busses 24. A step-down transformer(s) 26 reduces the ac voltage level and supplies the battery charger 20. The battery charger outputs a dc voltage for the RPS division load and to maintain the charge on a battery 28. Normally an RPS division takes its power from the battery charger. However, should the facility input ac power source fail, an RPS division is supplied continuing power from the battery. No switching or dc to ac inversion is involved, thus simplifying the system and eliminating additional component failure potential.

**DEPV:**

(10) Automatic self-testing--sensor input through actual scram breaker activation automatic test and monitoring. A limited test, sensor input through scram decision (without a scram breaker activation) is performed at least once each sensor polling cycle. An extended test, sensor input through scram breaker activation, is performed once each four hours for each division. Because the Plant Control System receives all RPS sensor and diagnostic data, the PCS is able to do additional, detailed off-line diagnostic and trend analysis with failure prediction as the objective. This off-line analysis cannot interfere with the RPS safety function but can result in early fault detection and problem correction. In addition, the PCS analyzes all RPS data for early fault detection purposes.

**DEPV:**

(15) The power sources for each division of the RPS electronics are dual, isolated, battery-backed dc power supplies with no dc-ac inverters and no switching involved in changing from facility power to battery power. The sources utilize both physical and electrical isolation such that the failure of one power system cannot cause the failure of the second. Independent, dual battery-backed actuator power sources, not shared by the RPS electronics, are provided for each scram breaker 2/4 logic train and its actuated safety device.

**CLPV:**

a respective ac-powered battery charger for supplying dc power via respective isolation diodes to said corresponding division electronics and one other division electronics during normal operation, each battery charger receiving ac power from a respective ac power bus, each ac power bus in turn receiving ac power from dual ac power sources, and

**CLPV:**

a respective backup battery for supplying dc power to said corresponding division electronics and said one other division electronics via said isolation diodes in the event that ac power should fail, said respective battery being charged by said respective battery charger during normal operation.

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a respective ac-powered battery charger for supplying dc power via respective isolation diodes to said corresponding division electronics and one other division electronics during normal operation, each battery charger receiving ac power from a respective ac power bus, each ac power bus in turn receiving ac power from dual ac power sources, and

## CLPV:

a respective backup battery for supplying dc power to said corresponding division electronics and said one other division electronics via said isolation diodes in the event that ac power should fail, said respective battery being charged by said respective battery charger during normal operation.

Main Menu	Search Form	Result Set	Show S Numbers	Edit S Numbers	Referring Patents
First Hit	Previous Document		Next Document		
Full	Title	Citation	Front	Review	Classification Date Reference Claims KWMC

[Help](#) [Logout](#)